

Supporting Information

For

Synthesis and Characterization of AgInS₂-ZnS Heterodimers with Tunable Photoluminescence

Xiaosheng Tang[†], Kuai Yu,[§] Qinghua Xu^{‡§}, Eugene Shi Guang Choo[†], Gregory K.L. Goh [#], Junmin Xue^{†*},

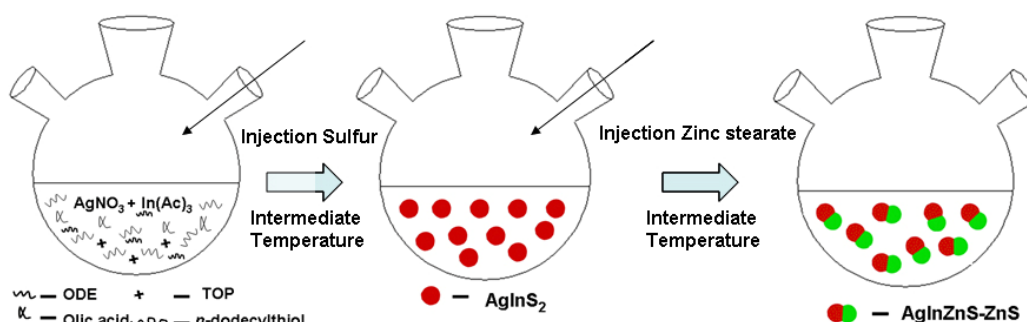
[†]Department of Materials Science and Engineering, National University of Singapore,

[§]NUS Graduate School for Integrative Sciences and Engineering

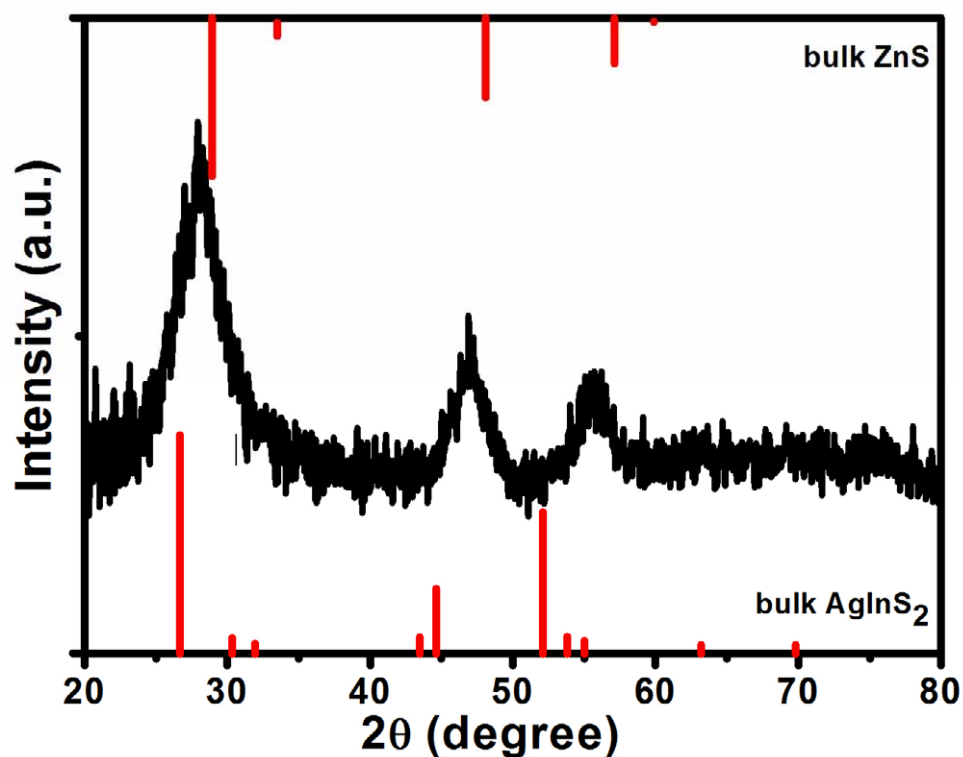
[‡]Department of Chemistry, National University of Singapore

[#] Institute of Materials Research and Engineering, A*Star, Singapore

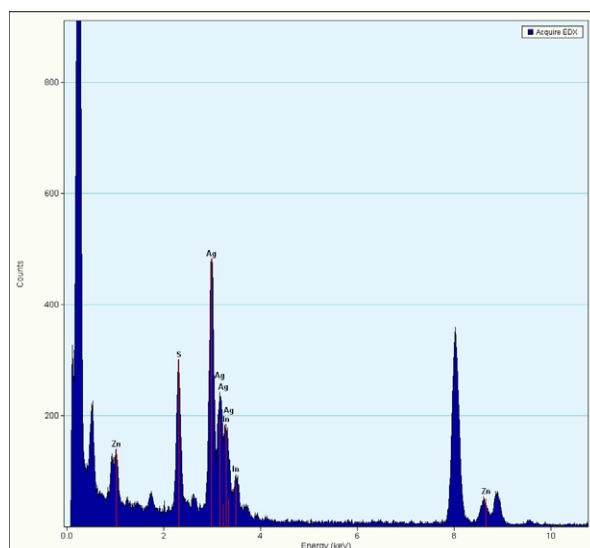
*E-mail: msexuejm@nus.edu.sg.



S_Scheme 1. Schematic illustration showing the synthesis of AgInS₂-ZnS heterodimers using a hot injection method.



S_Fig 1. The enlarged XRD pattern of the AgInS₂-ZnS heterodimers synthesized using the intermediate temperature of 90 °C, in comparison with the standard XRD patterns of chalcopyrite AgInS₂ and cubic ZnS.



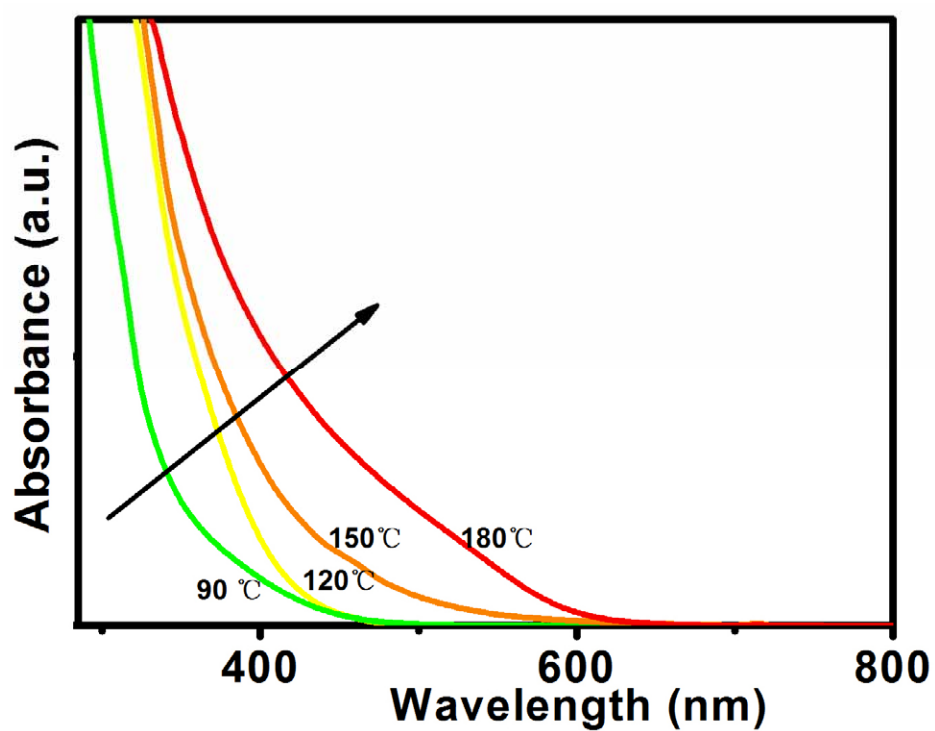
S_Fig 2. EDX spectrum of the AgInS₂-ZnS heterodimers prepared at 210 °C for 2 hours. The zinc source was injected at 90 °C.

S_Table 1 ICP analysis of chemical compositions of the heterodimers using different intermediate temperatures.

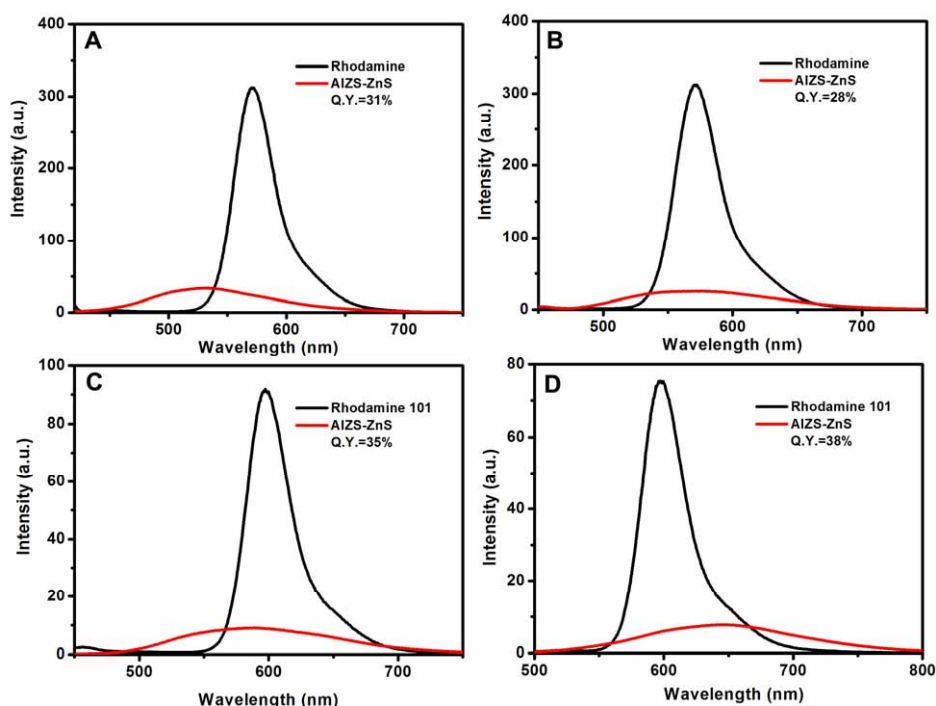
Element(mol/L) Sample	Ag	In	Zn	S	Ag:In:Zn:S
90 °C	0.03556	0.03789	0.14569	0.23469	1: 1.06:4.09:6.6
120 °C	0.09491	0.09141	0.27923	0.54031	1:0.963:2.94:5.69
180 °C	0.02389	0.02587	0.04923	0.10438	1:1.08:2.05:4.37

S_Table 2 EDX analysis of chemical compositions of the heterodimers obtained using different intermediate temperatures.

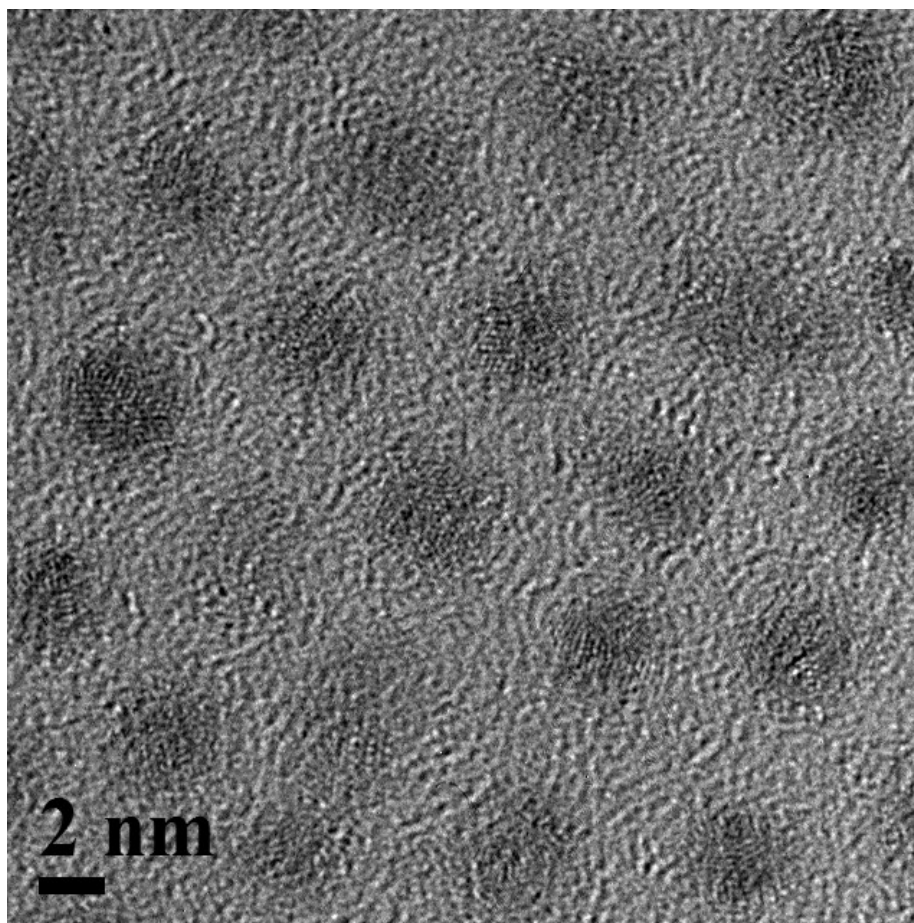
Atomic% Sample	Ag	In	Zn	S	Ag:In:Zn:S
90 °C	7.83	8.57	29.22	53.48	1:1.09:3.73:6.83
120 °C	10.46	9.51	53.09	29.99	1:0.91:2.86:5.07
180 °C	12.18	13.74	21.56	49.24	1:1.12:1.77:4.04



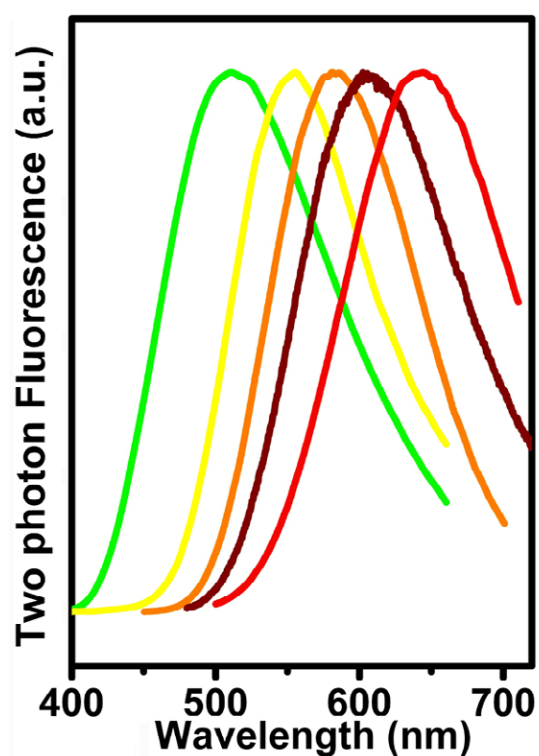
S_Fig 3. The absorption spectra of AgInS₂-ZnS heterodimers synthesized using the intermediate temperature of 90 °C, 120 °C, 150 °C and 180 °C, respectively.



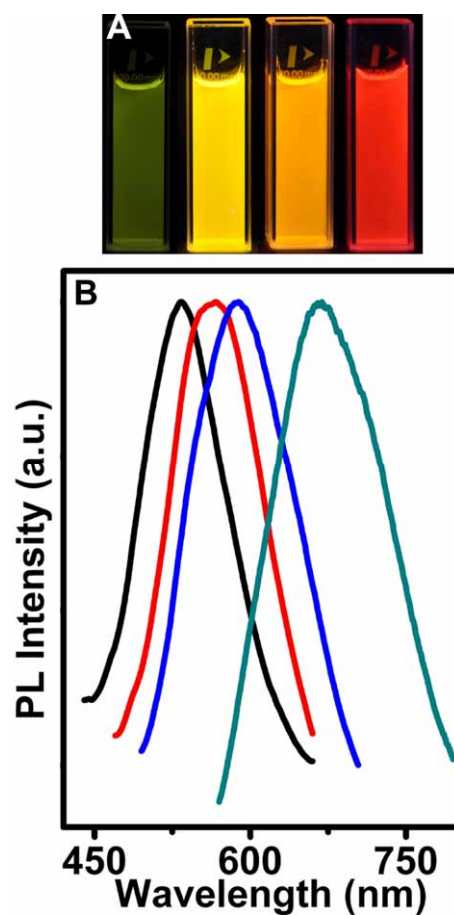
S_Fig. 4. (A) PL emission spectra of the $\text{AgInS}_2\text{-ZnS}$ heterodimers at 90 °C versus the standard rhodamine 6G ethanol solution (QY=95%), (B) PL emission spectra of the $\text{AgInS}_2\text{-ZnS}$ heterodimers at 120 °C versus the standard rhodamine 6G ethanol solution (QY=95%), (C) PL emission spectra of the $\text{AgInS}_2\text{-ZnS}$ heterodimers at 150 °C versus the standard rhodamine 101 ethanol solution (QY=100%) and (D) PL emission spectra of the $\text{AgInS}_2\text{-ZnS}$ heterodimers at 180 °C versus the standard rhodamine 101 ethanol solution (QY=100%). The quantum yields of the four heterodimers were 31%, 28%, 35% and 38%, respectively.



S_Fig 5. TEM image of AgInS_2 nanoparticles (blue emission) prepared using intermediate temperature of 60 °C.



S_Fig 6. The upconversion fluorescence spectra of the obtained heterodimers in toluene excited by 800 nm laser.



S_Fig 7. (A) Digital photographs of the obtained AgInS₂-ZnS heterodimers with different emissions in water; (B) PL spectra of the AgInS₂-ZnS heterodimers in water.